## WHAT IS CLAIMED IS:

1	1. A method for processing signals in a pulse oximeter to determine
2	oxygen saturation and pulse rate, comprising:
3	receiving waveforms corresponding to two different wavelengths of light from
4	a patient;
5	ensemble averaging said waveforms in a first ensemble averager;
6	calculating a pulse rate based on an output of said first ensemble averager;
7	normalizing said waveforms to produce normalized waveforms;
8	ensemble averaging said normalized waveforms in a second ensemble
9	averager; and
10	calculating an oxygen saturation based on an output of said second ensemble
11	averager.
1	2. The method of claim 1 further comprising:
2	said ensemble averaging using variable weights;
3	selecting first metrics for said first ensemble averager to optimize said
4	calculating a pulse rate; and
5	selecting second metrics for said second ensemble averager to optimize said
6	calculating an oxygen saturation.
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l	3. The method of claim 2 wherein said first and second metrics both
2	include an arrhythmia metric for detecting an arrhythmic pulse, said arrhythmia metric for
3	said first metrics, in connection with calculating a pulse rate, having a lower associated
4	threshold for recognizing arrhythmia than said arrhythmic metric for said second metrics.
1	4. The method of claim 2 wherein said first and second metrics both
2	include a short term metric which is a measure of short-term changes in pulse amplitude;
3	said first ensemble averager increasing an ensemble averaging weight in
4	response to a short-term decrease in pulse amplitude faster than said second ensemble
5	averager.
1	5. A pulse oximeter for determining oxygen saturation and pulse rate,
2	comprising:
3	a detector which receives waveforms corresponding to two different
4	wavelengths of light from a patient;

5	a first ensemble averager;
6	a pulse rate calculator, coupled to an output of said first ensemble averager;
7	a normalizer coupled to said detector for normalizing said waveforms to
8	produce normalized waveforms;
9	a second ensemble averager; and
10	an oxygen saturation calculator coupled to an output of said second ensemble
11	averager.
1	6. The pulse oximeter of claim 5 further comprising:
2	wherein said ensemble averagers are configured to ensemble average using
3	variable weights;
4	a signal quality metric calculator configured to provide first metrics for said
5	first ensemble averager to optimize said calculating a pulse rate, and second metrics for said
6	second ensemble averager to optimize said calculating an oxygen saturation.
1	7. A method for processing signals in a pulse oximeter to determine
2	oxygen saturation and pulse rate, comprising:
3	receiving waveforms corresponding to two different wavelengths of light from
4	a patient;
5	low pass filtering said waveforms in a first low pass filter;
6	calculating a pulse rate based on an output of said first low pass filter;
7	normalizing said waveforms to produce normalized waveforms;
8	low pass filtering said normalized waveforms in a second low pass filter; and
9	calculating an oxygen saturation based on an output of said second low pass
10	filter.
1	8. The method of claim 7 further comprising:
2	selecting first metrics for said first low pass filter to optimize said calculating
3	a pulse rate; and
4	selecting second metrics for said second low pass filter to optimize said
5	calculating an oxygen saturation.

1	5	7. The method of claim 8 wherein:
2	t	he low-pass filtering weight associated with said first low pass filter is based
3	on a frequency i	ratio metric which quantifies the frequency-content of said waveforms relative
4	to a pulse-rate e	stimate.
1	1	0. The method of claim 8 wherein:
2		low-pass filtering weight for said second low pass filter is based on
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3		frequency ratio metric which quantifies the frequency-content of said
4		tive to a pulse-rate estimate that metric, and
5	а	separate Ratio-of-Ratios variance metric.
1	1	1. A method for processing signals in a pulse oximeter to determine
2	oxygen saturation	on and pulse rate, comprising:
3	r	eceiving waveforms corresponding to two different wavelengths of light from
4	a patient;	
5	10	ow pass filtering and ensemble averaging said waveforms in a first low pass
6	filter and ensem	ble averager;
7	c	alculating a pulse rate based on an output of said first low pass filter and
8	ensemble averag	ger;
9	n	normalizing said waveforms to produce normalized waveforms;
10	10	ow pass filtering and ensemble averaging said normalized waveforms in a
11	second low pass	s filter and ensemble averager; and
12	c	alculating an oxygen saturation based on an output of said second low pass
13 .	filter and ensem	ble averager.
1	1	2. A pulse oximeter for determining oxygen saturation and pulse rate,
2	comprising:	
3	a	detector which receives waveforms corresponding to two different
4	wavelengths of	light from a patient;
5	a	first low pass filtering;
6	a	pulse rate calculator, coupled to an output of said first low pass filter;
7	a	normalizer coupled to said detector for normalizing said waveforms to
8	produce normal	ized waveforms;
9	a	second low pass filter; and

10	an oxygen saturation calculator coupled to an output of said second low pa	ss
11	filter.	
1	13. The pulse oximeter of claim 12 further comprising:	
2	wherein said low pass filters are configured to ensemble average using	
3	variable weights;	
4	a signal quality metric calculator configured to provide first metrics for said	d
5	first low pass filter to optimize said calculating a pulse rate, and second metrics for said	
6	second low pass filter to optimize said calculating an oxygen saturation.	
1	14. The pulse oximeter of claim 12 wherein:	
2	the low-pass filtering weight associated with said first low pass filter is bas	sed
3	on a frequency ratio metric which which quantifies the frequency-content of said wavefor	ms
4	relative to a pulse-rate estimate.	
1	15. The pulse oximeter of claim 12 wherein:	
2	a low-pass filtering weight for said second low pass filter is based on	
3	a frequency ratio metric which which quantifies the frequency-content of sa	aid
4	waveforms relative to a pulse-rate estimate that metric, and	
5	a separate Ratio-of-Ratios variance metric.	
1	16. A pulse oximeter for determining oxygen saturation and pulse rate,	
2	comprising:	
3	a detector which receives waveforms corresponding to two different	
4	wavelengths of light from a patient;	
5	a first low pass filtering and ensemble averager;	
6	a pulse rate calculator, coupled to an output of said first low pass filter and	
7	ensemble averager;	
8	a normalizer coupled to said detector for normalizing said waveforms to	
9	produce normalized waveforms;	
10	a second low pass filter and ensemble averager; and	
11	an oxygen saturation calculator coupled to an output of said second low pas	.SS
12	filter and ensemble averager.	
1	17. A method for processing signals in a pulse oximeter to determine	
2	oxygen saturation, comprising:	

3	receiving waveforms corresponding to two different wavelengths of light from
4	a patient;
5	processing a new waveform after a pulse period trigger to ensemble average
6	with a historical average waveform; and
7	when said new waveform differs from said historical average waveform by
8	more than a predetermined threshold, interpolating between the new waveform and the
9	historical average waveform for a first few samples of a new, composite historical average
10	waveform.

18. The method of claim 17 wherein said first few samples are four samples, and said interpolations are at 80%, 60%, 40%, and 20% of the difference between the new waveform and the historical average waveform.